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**WHAT ARE THE REAL RISKS OF KNOWING AND NOT KNOWING – LEADING
KNOWLEDGE IN CYBER**

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14. ABSTRACT

This paper represents the unclassified deliberations of the authors based upon research, assessment, analysis and application in the areas of Knowledge Management and Command and Control. This paper is written against the backdrop of the strategic failure of many Western Institutions, as witnessed on 9/11, in Iraq and Afghanistan and the Great Recession. At the same time there has been a wish to control, censure and manipulate more, notably within Cyber and seemingly correlating to an increase in damaging leaks that have further undermined the credibility, authority and standing of the political, those do with s?r?te (security, safety, trusts and assurances) and the economic. The great freedoms bestowed on us by our forebears are under threat more, it seems, from a collective failure to re-design the knowledge enterprise economies that will secure our futures than any existential threat, per se. At the same time, the perceived and actual failure of Western Institutions has given strength to those tyrannies, extremists and regimes whose advantage is antithetical to the wellbeing of Liberal Democracy and the peoples they serve to represent. We have been here before, as testified by John Winthrop and Presidents Kennedy and Reagan when they spoke, respectively, of a ?city upon a hill?, ?constructed and inhabited by [peoples] aware of their great trust and their great responsibilities? and of ?a tall proud city built on rocks stronger than oceans, wind-swept, God-blessed, and teeming with people of all kinds living in harmony and peace, a city with free ports [humming] with commerce and creativity?. As our Armies return battered from more than a decade fighting, it is necessary to move from the ?fought to thought? as we design and build afresh. We examine information, data and knowledge and take forward concepts for Information Capture and Knowledge Exchange (ICKE) in Cyber. We consider leadership and management of the emerging Knowledge Enterprise Economies and how we may make best use of our resources and peoples, military, civil and veterans. This paper examines some of the challenges we face as we commence this step change to a new future.

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ABSTRACT

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The views expressed in this paper are entirely and solely those of the authors and do not necessarily reflect official thinking and policy of the US, UK or Australian Governments, Agencies or Departments of Defense.

1. Background

‘Every Country has the Government it deserves’
(Attributed to de Maistre (1753-1821))

We argue that we are at a time of step change where, if liberty, freedom, and democracy are to survive, then the redesign and renewal of the way we aggregate our organizations and institutions and apply their knowledge and information in the future will be vital. If what de Maistre says is true, then it suggests that government is an emergent property alongside strategy, design, engineering, industry and adaptation. In other words, we also get the institutions and organizations and the political economic sûreté (trust, assurance, safety and security) ‘we’ deserve [1]. Designs of our organizations and institutions and how we explore and (not only) exploit their knowledge and information bounds are imperatives for how we create the industry (in its wider setting) necessary for productivity, adaptability, and resilience. By creating false competition, leading ultimately to hyper-competition, the essential variety [2, 3] necessary both for control and adaptation may have been removed from our organizations and institutions [1]. This paper presents current thinking on management and information trends. We then consider organizational knowledge profiles before examining Leadership and Management structures as they may be applied in the future. Running through this paper is a view that ‘we owe it to young and future generations and returning (often injured and wounded soldiers, sailors, marines and airmen) to restore our City beacons and allow them once more to shine forth; illuminating dark recesses by providing hope and inspiration to all people’.

2. Résumé

In this section we provide a brief summation of some of the concepts emerging from our research. Previously, Reay Atkinson, Leshner and Shoupe introduced four concepts in their paper on Information Capture and Knowledge Exchange:

On the **Management of Knowledge**, based on the Three Needs Model (3NM), ‘need-to-know’; ‘need to share’ and ‘need to use’:

‘A cross-disciplinary organic enterprise connecting and integrating social, cultural, communication and technical processes – including trust, obligation, commitment, and accountability – to facilitate creative learning and adaptation and leverage information capture and knowledge exchange (ICKE) by connecting communities who-need to-know with those who-need-to-share with those who-need-to-use’[4, 5].

On Communities of Influence (as opposed to Practice or Interest):

‘Distributed, collaborative and inclusive groupings working to discover, synthesize and exchange knowledge through the sharing of information in order to: take better decisions; implement change and create effects’ [4, 6-13].

On Integration:

‘The ability of networked systems, units or forces to provide and accept services from other systems, units or forces by uniting procedures, rules and information so that, when formed, the force operates together more effectively, capably and seamlessly as a whole’ [4, 14].

On Information Capture and Knowledge Exchange (ICKE) (pronounced ‘Ike’ after President Eisenhower) and based upon Soviet concepts for Razvédka Bóyem:

‘The active gathering and capture of information (and data) for testing (abducting, inducting and deducting) through social exchange’ [4, 15-20].

Further research by the first author led to considerations of Fitness and Finessing:

On Fitness:

‘As a function of a systems ability to *test* its environment; comprehend and verify what is known and unknown and infer; estimate and *model* its ecology’ [15, 21, 22].

On Finessing:

‘As enabling model variation using the past as a partial constraint on the present [23] by: formalizing substitutions without affecting application [24]; tailoring to represent the local system [25]and maintaining equivocality in interpretations of models and their ecology [26]’ [15] .

We considers that there are two predominant, coupled systems at play within contemporary organizations, one to do with collaborative social influence (CSI) in which the social drives the IT (SIT) e.g., in a design department and the other to do with coordination, rule and control (CRC) in which the IT drives the social (ITS) [27, 28], e.g., Just in Time manufacturing. These two systems have different and at times conflicting or antithetical characteristics, one to do with *weaker* social signals and influencing / responding, *over time* (CSI / SIT); the other relating to *stronger* signals necessary for controlling / reacting, *in time* (CRC / ITS) [29-32]. In this respect:

‘**CRC / ITS** systems seek to program¹ the relationship between technical processes and humans by digitizing performance fidelity and coding for repeatable *risk free* procedures in computer-control (cyber) spaces so that data and communication do not [temporally] contradict each other ’ [33].

By contrast:

‘**CSI / SIT** systems stress the reciprocal interrelationship between humans and computers to foster improved shared awareness for agilely shaping the social programmes of work, in such a way that humanity and ICT [control] programs do not contradict each other ’ [33].

The two systems also have different signatures, where CRC / ITS systems are considered as strong-signal systems, in which: ‘System Information and Communication are the key variables’, after, Castells [34] and Sokol [35] and *weak-signal* CSI / SIT systems, in which: ‘Influence (through shared awareness) and Control (through switching) of Information and Communication are the key variables’, after Castells [34]. We consider that **Cyber** comprises these two sub-systems: ‘Coordination Rule and Control (CRC)’ and ‘Collaboration and Social Influence (CSI)’ [3, 27]. These system attributes provide the necessary and “requisite variety” [2] to enable both *control*, ‘in time’, and *influence* [36-40], ‘over time’. In this regard, Cyber may consist of two poles:

‘A technologically bounded, largely immeasurable, strongly scientific, stochastic *coordination*, *rule* and *control* space; comprising virtual-media and the display of data dealing with the *real* communication of *facts*; and the *conceptualization* of alternative

¹ As opposed to programme.

possibilities, themselves capable of generating hard physical and soft more *social* effects and *collaboratively influencing* them'[41].

This paper builds upon these bounded definitions to consider risk in its wider setting and as applied to trusts and assurances within the emerging Knowledge Enterprise Economies (or KEEs) [42, 43]. We consider in this model the leadership and followership models necessary to make sense of an increasingly info-technologically rich society and, as significantly, how we might manage the inevitable shocks we are likely to encounter downstream. We examine this with respect also to the need to re-design our institutions if we are to successfully engage with this future and preserve the goods while allowing for adaptation.

3. Knowledge Profiles

It is important to consider how institutions / organizations create and maintain the necessary reflective capacity in which information can be captured and knowledge exchanged, over time. The literature suggest that organization and institutional structures are supposed to facilitate the exchange of information among individuals by creating stable and regular patterns of communication [44]. Knowing how knowledge is captured, stored and shared requires an understanding of organization and institutional knowledge sharing [4]. In this section, the different perspectives of organizations and institutions and their forms are explored. Then the relationships between their structures and communications network are examined. Cyert and March [45] suggest that an organization needs to be 'viewed as a coalition of individuals', some of them 'organized into subcoalitions' [46]. Arrow [47] highlights that formal institutions, firms, labor unions, universities, or government, are not the only kind that represents the term 'organization'. Organizations always face new needs triggered by the external ecologies that well-known and well-tested structural design of 'functional' and 'decentralized' institutions cannot always satisfy. Arrow [47] noted that new networked designs were emerging to accommodate these changes to systems structure.

Mintzberg [48] identifies five basic organizational forms: the machine organization; the entrepreneurial organization; the professional organization; the adhocracy organization; and, the diversified organization. Highly formalized, specialized and centralized institutions that standardize work processes for coordination are common to the machine organization. The entrepreneurial organization can be classified as an organization with flexible structure and controlled directly by the executive. Carrying out professional work in a relatively stable setting and emphasizing the standardization of skills with the administrators serving for support more than exercising control is central to a professional organization. However, working in a dynamic environment requires expert members to work collaboratively in project teams to serve the dual nature of institution authority and information reporting, as recognized in the form of 'adhocracy organization' [48, 49] [48, 49]. In this form, institutions may be divided into functional organization (or departments) so that firms can respond 'in time' to external changes occurring 'over time'. Dividing functions into semiautonomous organizations, so that they can serve a diversity of markets (with the headquarters providing financial control for standardizing outputs of the organizations), Mintzberg [49, 50] sees as an important classification role of an institution.

We distinguish between standardization and classification. Too often at the institutional level, there may have been a wish to standardize as a means of optimizing the operational and unit levels. This can work, provided proper System Identification has been undertaken beforehand and the right tools are applied [51]. More often than not, strong-signal, black box tools (applicable to controlling ITS systems, in time) have been applied to SIT systems necessary for 'influencing complex systems, over time' [52]. System identification has not been undertaken; correct classification (in terms of SIT and ITS systems) has not been done and, as a result, the wrong tools are selected. Effective management of knowledge, in terms of ICKE [4] should prevent 'knowledge stripping' [33] but only if organizations create a 'value set with knowledge at its core' [53]. Where we see knowledge stripping (akin to but worse than asset stripping) as being: 'the progressive removal of social knowledge from an organization, over time' [33].

Milton considers four institutional knowledge competencies: strategic; competitive; core and non-core. We see these as providing a basis for effective social collaboration; so managing the tensions between over controlling / safeguarding information and improving knowledge processes so we can both shine our light into dark recesses (e.g., of the Web) while maintaining our freedoms. Milton's understanding of competitive competence linked to competitive advantage is based upon a skill set or resource that one organization possesses that another does not. From these asymmetries, an exchange or market might form: e.g., labor for pay. In a non-resource constrained environment, such competition is manageable and can create a 'gale of creative destruction' [54]. In a resource constrained environment hyper-competition may result:

defined by D’ Avani [55] as ‘an environment characterized by intense and rapid competitive moves, in which competitors must move quickly to build advantage and erode the advantage of their rivals’ i.e., it is no longer manageable. Wiggins and Ruefli [56] noted that ‘over time competitive advantage has become significantly harder to sustain’ (in other words less resilient) and the ‘time constants’ (notably in ‘high technology’) have become shorter. In such environments – for example post ‘peak-oil’ – there is the potential for hyper-competition, where the basic *sûreté* necessary for collaboration breaks down. Hyper competition can be created / exacerbated by an over-emphasis on control and coordination tools, such as Performance Management [33]. In such an environment the market no longer operates and competing-monopolies can rapidly form; introducing yet more competition into the system. For example, constraining resources through optimization creates more competition; leading in some circumstances to hyper-competition and even conflict. As opposed to competitive knowledge, co-adaptive [22] knowledge is posited to be: ‘areas of a new and evolving knowledge that an institution knows a lot about and can give it an adaptive advantage as a first learner’ [53, 57].

| | | |
|---------------------------|--|--|
| New Emergent Knowledge | Strategic Competence Unknown-Unknowns | Co-Adaptive Competence Unknown-Knowns |
| | Non-Core Competence Known-Knowns | Core Competence Known-Unknowns |
| Old established Knowledge | | |
| | | |
| | Low Level of In-House Knowledge | High Level of In-House Knowledge |

Figure 1: Organizational Knowledge Matrix after Milton and Rumsfeld

Combining the Milton model into a structural knowledge matrix, Fig. 1, it is possible to ‘situate’ institutional knowledge. An effective institution capable of learning – and continuing to learn – needs to occupy the strategic, unknown-unknowns² (its research and thinking capacities) and co-adaptive, unknown-knowns (its design and adaptation capacities) competencies and to ‘guard what it knows’ (e.g., for a Navy to build, crew and fight warships) [53]. That same institution needs to retain certain core knowledge (known-unknowns) but can choose to transfer elements of its non-core business (known-knowns) to an external agency (e.g., management of pay rolls). Milton recognized that consultancies should be applied at the non-core and core competency levels; specifically in identifying non-core from core activities. Effective (as opposed to just efficient) institutions also retain ‘in-being’ the reflective capacity – capable of identifying and exploiting ‘new and evolving knowledge’. This is the domain of ‘unknown-unknowns’ and ‘unknown-knowns’ that defines an organizations ‘intellectual property’. The inability of institutions to understand their core business and ‘being’, we contend, has led to a structural failure to retain behavioral *reflective capacity* for adapting, envisioning and designing alternative futures and to the improper transfer of core and non-core competencies – hence ‘knowledge stripping’. This can often be seen in the confusion between training, which is essentially part of a *fail-safe*, control regime (focused on managing the rules and concepts); and education designed around a *safe-to-fail*, reflective ecology (focused on creating new concepts; leading change and adaptation) [2, 3].

4. Leadership & Management

Drawing on work by Alberts & Hayes [58] and Reay Atkinson & Moffat [13] we differentiate between *fidelity*, in terms of ‘removing noise from an info/techno-socio system’ (see Atlan & Cohen, [59]) and *agility*, in terms of a socio-techno system’s ‘reflective capacity’ (indicative of fitness, see De Rosa et al, 2008) [21] to ‘identify mutations (noise) as a vehicle for adaptation’, see Atlan & Cohen [59]. It is therefore suggested that:

‘Management & Control may be a function of rules, time, bandwidth and fidelity, whereas Command & Leadership may be a function of influence, trust, collaboration and agility’ [60].

²‘Reports that say that something hasn't happened are always interesting to me, because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know’, Donald Rumsfeld, US SecDef, 2001-2006, DoD News Briefing - Secretary Rumsfeld and Gen. Myers, February 12, 2002, <http://www.defense.gov/transcripts/transcript.aspx?transcriptid=2636>.

Note: that while the word ‘command’ is often associated with strict rules and control mechanisms, it is being used here in the military sense, where it is roughly synonymous with leadership.

It is posited, after He & Wong [61], that successful organizations are constantly balancing between the *exploitative* (delivered *in time* by management & control) and the *explorative* (delivered *over time* through command & leadership). The balancing between management & control (the exploitative) and command & leadership (the explorative) to keep an organization *in kilter* is known also as *ambidexterity*. This suggests that the ability to *dynamically balance* between the *exploitative* and the *explorative* is indicative of a systems ability to problem solve and, hence, of its health. As technology has advanced, the social management of organizations has become more complex. Managers at all levels of the organization need both a deeper understanding of interactions between the individual, group, and organizational levels, and confidence / trust in the information and knowledge being exchanged [4]. An emphasis on IT and data rather than on social knowledge [17] has also led to internal competition (e.g., between service level suppliers rather than supplying the best product) even hyper-competition (by resource constraint) as a result of increased accessibility to information [62]. Consequently, leaders and managers need to become better at identifying the systems they are working with and ‘managing the social capital via which [information] is both produced and shared’ [63]. Dahl [38], argues ‘agents exert social influence [he defines power in terms of a relationship between people] through the manipulation of a base of resources’. Wrong [40] saw people exercising *Mutual Influence* and *Control* over one another's behavior in all social interactions. Anderson [64] concluded that *mutual influence* and *control* formed a ‘convenient intersection between risk, trust and technology’ from which Felici [65], noting the ‘complexity of trust’ and that it was ‘unfeasible to take a definitive model’, suggested (see McKnight & Chervany [66]) a ‘typology of trusts’ which may (after Hickson et al [67]) broadly align with *relational* collaboration, combining aspects of *behavioral* and *structural* trusts [15]:

Relational (Ambidextrous [61]) – combining CRC / ITS and CSI / SIT: *Situational [Aware] Decision Trust* in which people are entrusted to behave reliably in certain ways based upon system hierarchy, structures, rules, and identified sources of power; *Trusting Intention* in which people behave reliably in ways based upon the common understanding of a systems hierarchy, its structures, rules, and identified sources of power.

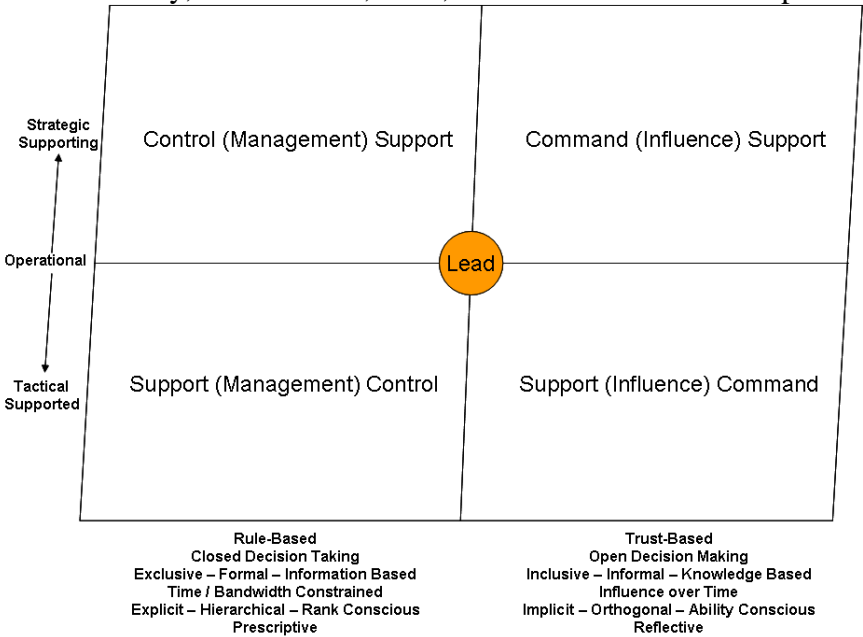


Figure 2: Non Orthogonal (connected) Command (Influence) and Control Quadrants Merging work by Alberts & Hayes, [58] and Reay Atkinson & Moffat [13]

Command is not control and in the British and Australian military may be more by ‘social influence’; see Ho [68]; whereas Management, with its emphasis upon performance, may be seen to align more with Control. More recently, military organisations have formed functional structures to provide support (to the) command and the command (with) support. So, for example, operational commands are supported (command support) by the other arms and, at the same time, support is provided by the non-fighting (supporting) elements – for example logistics and supply. Figure 2 analyses the functions of organization networks, in terms of info/techno-socio structure and socio-info/techno behavior. Four non-orthogonal (i.e., entangled) quadrants were identified: Command Support; Support Command; Control Support, and Support Control. Like Command, the controlling elements are themselves supporting and supported with support control subordinated to control support. From Figure 2, Technical / specialist Leadership is more likely to exist in the right of the two quadrants where it acts as leadership (command) support in

its own right, i.e., delegated to take command or supporting command through its department and skills base. From this analysis, it may be suggested that:

‘Specialist (Technical / Engineering) Leadership is likely to be trust and influence based, exercising a reflective, conceptual and implicitly ability conscious, open, inclusive and informal, decision making / taking style’ [69].

5. Coping or Failing?

In this paper, Mutual Information (MI) is considered as ‘a measure of the amount of information one random variable contains about another’[70]. MI does not have a time base and so cannot measure flows. Transfer Entropy is ‘a model-free measure of information flows between different time series’ which, ‘under weak assumptions, allows [for the quantifying of] information transfer without being restricted to linear dynamics’ [71, 72]. Unlike MI, Transfer Entropy is ‘based on rates of entropy change’ [73] and so ‘captures some of the dynamics of a system’ [74]. Mutuality based on trust may occur only if certain conditions are met and structural relationships maintained, over time. As observed by Rosabeth M. Kanter³, ‘true freedom is not the absence of structure...but rather a *clear* structure that enables people to work within established boundaries in an autonomous and creative way.’ Considered in terms of MI, CSI / SIT systems are more likely to develop collaborative structures, over time, that have mutual / shared information about one another. Whereas, CRC / SIT systems are more likely to apply cooperative structures, in time, for satisfying certain market or pricing mechanisms, e.g., in a Stock Market.

A traditional view of Change Management is shown by the ‘step change’ applied to a ITS control type system in Figure 3. Change creates an instantaneous (linear, over time) response from the system until it reaches the required change state. At this point there is some *hunting* as the system settles to its new state and awaits future demands. As described by McOwat [75, 76], what happens when this model is applied to a SIT system, is that the system responds as directed to meet set targets. Over time, because of lack of investment and the recognition that change is costly to any organization (there are often very good individual and collective reasons not to change) performance actually falls off, Figure 4. As described by Longstaff [77] and Reay Atkinson et al [33], what actually happens may be as follows:

‘Initially, managers and practitioners combine to set and agree targets. The targets appear reasonable and practitioners, consultants and [managers] are satisfied. At about the three year point⁴ [78] those initially responsible for agreeing and setting the targets move on, through promotion, selection, transfer or on leaving [MI↓]...Targets continue to be met...satisfaction reportedly continues to grow and the managers remain “satisfied” that targets are being achieved. At the five year point, the rate of change / satisfaction begins to reduce [TE↑; MI↓]...anyway, the manager / practitioner only has a year to do and is seen to have done well: why rock the boat? By this stage, on average, [in the UK National Health Service] there has been 100% turnover in staff since the change program was implemented⁵ [MI↓; TE↑]...Strategic, co-adaptive (collaborative / federated) and agile core knowledge [MI] has been *stripped* from the organization [TE]. After 10 years...the [Organization] no longer has in place the proficiency and expertise [MI] to agilely design alternative possible futures or provide plausible explanation of intuition and invention of reason (phronesis) see Dreyfus [57]’.

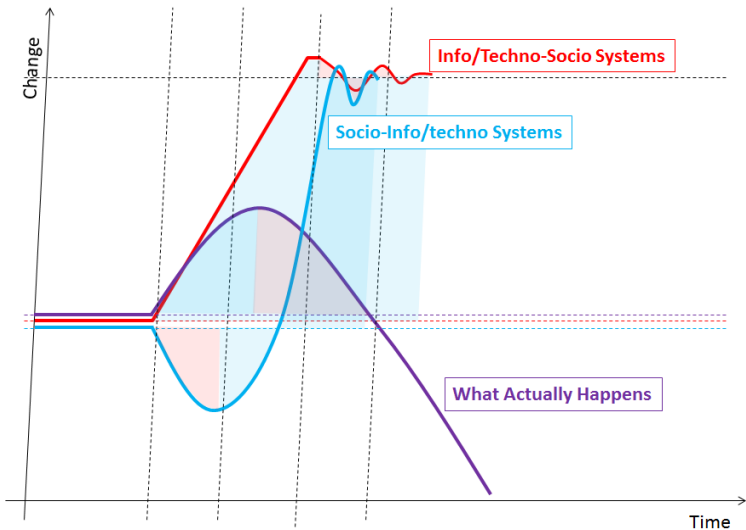


Figure 3: Change Dynamics ITS System versus SIT System and what actually happens when wrongly applied [15, 75, 76]

³ Ernest L. Arbuckle Professorship at Harvard Business School.
⁴ 2-3 years is the average time managers / practitioners remain in a particular post in the Public Sector corresponding to a 100% turnover in staff every 4.5-6 years [78].
⁵ Ibid.

Through the lens of MI and TE, what appears to occur is that some form of existential pressure – acting potentially as a ‘shock’ – is administered to the system. Rather than allowing a socio-info/techno system to change, this ‘change impetus’ creates a loss of Mutual Information and an increase in Transfer Entropy. Collaboration, based on old certainties, is no longer possible and people need to find their way and new ‘values and common reference points’ [79]. In reality, a period of negative change (when organizational core-competencies may actually reduce) during which time TE increases and MI (including the opportunity for collaboration) decreases (as can be measured in terms of shared awareness [15]). How long this continues, it is posited, is based upon the amount of investment made into a socio-info/techno organization before and after the decision has been taken to change. There is no guarantee that the change will go as directed so, before an organization can change, it also needs to explore and identify the bases upon which change may take place. There are important learning and coping strategies that would appear to emerge from this analysis, also having to do with potential implications for managing Post Traumatic Stress Disorder or PTSD: ‘UK Service personnel returning from the Falklands were analyzed in terms of stress. The theory suggested at the time was that those from broken families might suffer more stress related symptoms than those from more stable families. They did not. What was found was that individuals from a stable and supporting background bounced back more quickly’ [80, 81]. It was concluded ‘that a supportive family and platoon / ship / unit network allowed the service-person to cope by limiting the extent of Transfer Entropy occurring after the existential *shock* of conflict and creating new reference points (MI) about which collaborative learning and coping strategies might emerge’. From experience in Northern Ireland, it was also learned how people adapted to operational shocks during a tour of duty. An individual arrived ‘in theatre’ with a level of competence based largely upon previous experience, education, and training (MI) for the job they were going to do. They arrived with a basic level of competency from which, they were expected to learn / improve on through experience. Three other important observations were also made [81]:

1. ‘If the individual suffered a ‘shock’ early in their tour (A) then there was an immediate loss of competency A-B (TE↑) but, more significantly, that individual would never recover to a level of competency higher (MI) than they were when the shock occurred by the end of their tour, B-C/D’.
2. ‘If the individual suffered a shock A’’ later in their tour the same immediate increase in TE occurred, A’’-B’’, and although the individual would not recover to a level above that when the shock occurred, the overall loss in competency and MI was much reduced (A’’-C’’/D’’) as compared to A-C/D. The conclusion drawn was that the later an individual suffered a shock, the better – which obviously meant something different to those wishing to destabilize an organization’.
3. ‘If the individual was part of a close knit collaborative (shared aware) networked team with high MI, then although the individual may suffer the same shock than when working alone / as an individual, A’-B’, just as the shock was mitigated and shared, so the individual and team learned [MI↑]. Consequently, the final competency level (C’-D’) was improved. The organization had become more adapted and able to cope with existential shocks than it had been beforehand or would have been if operating as a group of loosely connected individuals’.

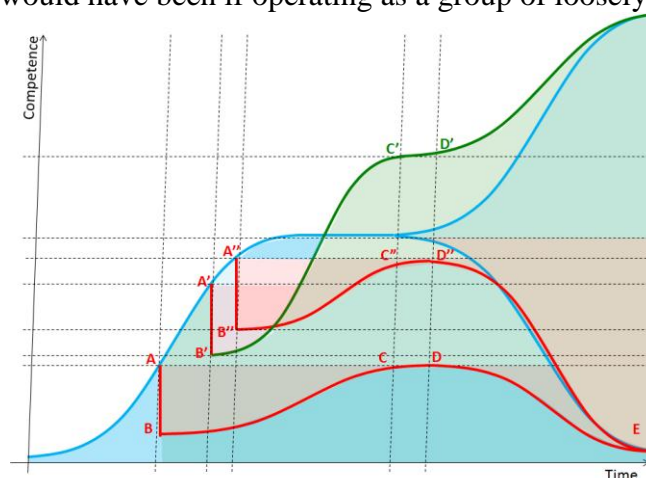


Figure 4: Managing Shock (TE) and Collaboration (MI) Over Time

The subsequent behavior of the organization was not necessarily examined. It is conjectured an individual who was part of a close-knit team would respond to change: a) from a higher position of MI (than the other organisations), C’’-D’’; so, b) future change (TE), may be less significant; and, c) they might achieve a higher level of competence than those ‘starting from scratch’. Similarly, whereas individualistic models may never achieve lasting change in the way and may wish to shed / forget (D/D’’-E), as quickly as possible what MI they had learned [TE↑], a team was more likely to retain base level skills [MI] over time and revert, if anything, to higher competency levels (perhaps C’’-D’’), Fig. 4.

6. A Call to Arms

Foreman [82] introduced the concept of *Quatrage*, recognizing that rather than triage, given the number of seriously injured service personnel (mostly young men) returning from Iraq and Afghanistan who would not have survived in previous conflicts – and that *Triage* had broken down. These numbers in the United States, United Kingdom and Australia as well as other Allies such as Canada, Denmark and the Netherlands now run into their thousands. This does not represent the subsequent waves of sufferers from PTSD yet to come. Many of our institutions have failed, see UK House of Common's Public Administration Select Committee report regarding the failure of the UK at the strategic level [83]. This strategic failure is not confined to the UK and but also extends to the political, sûreté and economic departments and institutions of state that serve them. At the same time, the Armed Forces that have been engaged over the previous decade are simply no longer affordable (e.g., the reduction in numbers of the Littoral Combat Ship and the halving in size and capability of the UK Armed Forces) – just at a time when our collective defense has never been weaker. The more we have sought to control, the more our organizations have leaked and the more unhealthy if not dangerous places they have become [60]. As they have become less healthy, so people have no longer wished to follow or to 'be' a part of the enterprises that represent our countries nationally and internationally. So the collective trusts that together form our common understanding and commonwealth have been further eroded. Moreover, instead of wanting to belong – peoples are now looking to oppose or to join alternative organisations / institutions / enterprises potentially antithetical to our own. At the same time that investment in defense has sharply declined / been cut so too has Western investment in research. Just as it is increasing in China and the Far East – and now apparently leads the US and Europe in terms of patents and papers.

Warren and Warren considered 'organizational health' and concluded that 'healthy organizations' have 'a critical capacity for solving problems', [84]. They identified three dimensions of connectedness (see also Thibaut and Kelley [85]): *identification* with the organization (they referred to as neighborhood); *interstitial interaction* within the organization and *existential linkages* outside the organization. Considerations of health apply equally to organisations working with/in the Cyber and their capacity for "problem solving" and so controlling, in time, and influencing, over time. People want to belong and to contribute. We have a significant number of injured service personnel returning from the wars. We have a responsibility to them and also to our young people to enable them to thrive successfully in the knowledge enterprise economies of the 21st Century. This will be our greatest sûreté – providing *resilience* against future shocks and existential tyrannies. Concepts such as the UK Veterans Information Communication Technology Occupational Recovery (VICTOR) enterprise that seeks to employ injured service personnel in operational centers to civil solve problems (handling the disruptions caused by ash clouds, for example), over time, may be just such an innovative example.

Designs for public service institutions such as the civil/ public service [86] are in desperate need of overhaul, witness the Global Financial Crisis but also the *affordability* bubbles bursting in higher education and in health. New designs are called for [87] that will be affordable (politically, militarily and economically) and sustainable into the future, e.g., based upon bringing *dual-use* versatility and modularity back into the fray [87]. For defense and sûreté, this means us all (politicians, business folk, financiers, bankers, industrialists, public and civil servants, soldiers, sailors, marines, airmen, academics, and researchers) thinking again with more of a strategic and adaptive than a static peacetime mentality. The dis-association and disaggregation of people from IT and the desire for more and more Cyber-IT to control the social (ITS) will need reconsidering. In simple terms, we have spent the last thirty years taking people out of the system – and so increasing the likelihood of shocks by reducing MI and thereby *resilience* – and need now to start putting our people (from all walks of lives and backgrounds) back in the driving seat (SIT). Key to the Knowledge Enterprise Economies (KEEs) of the 21st Century, will be how we lead and manage our people in the future – and, as we have argued at both the Universities of Sydney and Cambridge and amongst ourselves, how we 'design humanity back into the loop' [88, 89] and so rebuild our *enlightening* 'cities upon the hill'.

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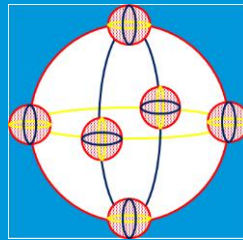
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WHAT ARE THE REAL RISKS OF KNOWING AND NOT KNOWING – LEADING KNOWLEDGE IN CYBER

Presented by Mrs Anne Bader



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19th ICCRTS: C2 Agility: Lessons Learned from Research and Operations

Simon Reay Atkinson, Professor, Dr., Complex Systems, Sydney University, Captain RANR

Amanda Goodger, University of Cambridge PhD Researcher, Director In-Lode™

Steve Lesher, Deputy Chief J6,USCENTCOM

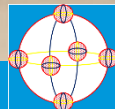
Nicholas Caldwell, Dr., Lecturer in Information Technology, University Campus Suffolk

Jodi Steel, Dr., Director of NICTA's Security and Environment Business Team

Dale Shoupe, Professor, Maxwell USAF, Air Education and Training Command , Air War College

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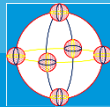
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Agenda

1. Thank You to ICCRTS and Dr David Alberts
2. Introduction of Authors and Presenter (Mrs Anne Bader)
 - The Auld Alliance – US; AS; UK
 - USMC; Royal Australian Navy; USAAF (order in age)
 - Communications and ICT Agencies / Schools / Commands (CENTCOM)
 - Universities – Cambridge; Sydney; Suffolk, Air War College
3. Why – the Problem set.
4. A New Synthesis
5. Leadership and Management
6. Coping or Failing
7. A Call to Arms

The Problem Set

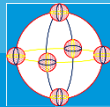


‘Every Country has the Government it deserves’

(Attributed to de Maistre (1753-1821))

- › We are at a time of step change;
 - If liberty, freedom, and democracy are to survive, then the redesign and renewal of the way we aggregate our organizations and institutions and apply their knowledge and information in the future will be vital.
- › Government is an emergent property alongside strategy, design, engineering, industry and adaptation:
 - Designs of our organizations and institutions and how we explore and (not only) exploit their knowledge and information bounds are imperatives for how we create the industry (in its wider setting) necessary for productivity, adaptability, and resilience.
- › This paper presents current thinking on management and information trends, including:
 - Organizational knowledge profiles;
 - Leadership and Management structures as they may be applied in the future.
- › Running through our paper is a view that ‘we owe it to young and future generations and returning (often injured and wounded soldiers, sailors, marines and airmen) to restore our City beacons and allow them once more to shine forth; illuminating dark recesses by providing hope and inspiration to all people’.

A New Synthesis



- › We need increasingly to consider our *entangled* Synthetic Ecology as:
 - ‘A system (being or entity) that adapts, over time, by combining, through design and by natural processes, two or more dynamically interacting networks, including organisms, the communities they make up, and the non-living (physical and technological) mechanical components of their environment’ (Reay Atkinson et al, 2014a).
- › This may therefore be the end of the ICT / computer age and the beginning of the *Synthetical Age* where we need to start designing and building afresh – and ‘putting humanity back in the loop’.
 - What will our universities, engineers, lawyers, medics, soldiers, armed forces, navies, armies look like in the 21st Century?
 - These are the questions we need to start asking.

- › Frequently we are presented with situations where decisions need to be taken and yet when there is *uncertainty* as to how best to proceed. In other words, there is more than one solution and we are dealing, potentially, with a complex problem.
- › *Uncertainty* applies to probabilities, as in a Risk Register and to physical measurements that are already made, or to *known-unknowns*, *unknown-knowns* and *unknown-unknowns*. Specifically, *Uncertainty* may:
 - ‘arise in partially observable, opaque, stochastic environments / non-ergodic (complex) ecologies, overly prescribed, ruled or controlled regimes as well as due to lack of assurance, *instability*, ignorance and / or lack of caring and shared awareness; including indolence.
- › *Instability* can create *Uncertainty* and *Uncertainty* can create *Instability* but they are not the same thing. *Instability* is considered as:
 - ‘the quality or state of being *unstable* and / or the tendency to behave in an *unpredictable*, changeable, *uncertain*, or erratic manner’.

The Gold Standard of the Future Organisation

- › We consider that *engagement* incorporates response and that *mitigation* and *preparedness* are elements of *Recovery* and *Prevention*.
- › We suggest that the ability to *Prevent*, Engage (when are where we have to) & *Recover* is indicative of our *Resilience*, where we see:
 - ‘Resilience to be the *ability* of an *ecology* or *system* to *adapt*, transform, redesign, *renew*, and *recover* in a timely response to events’ (after [Bryant, 2012](#)).

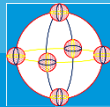
- › On the **Management of Knowledge**, based on the Three Needs Model (3NM), ‘need-to-know’; ‘need to share’ and ‘need to use’
 - ‘A cross-disciplinary *organic* enterprise connecting and *synthesizing* social, cultural, communication and technical processes – including trust, obligation, commitment, and accountability – to facilitate creative learning and adaptation and leverage information capture and knowledge exchange (ICKE) by connecting communities who-need to-know with those who-need-to-share with those who-need-to-use’.
- › On **Information Capture and Knowledge Exchange (ICKE)** (pronounced ‘Ike’ after President Eisenhower who knew a thing about complexity...) and based upon Soviet concepts for Razvédka Bóyem:
 - ‘The active gathering and capture of information (and data) for testing (abducting, deducting and inducting) and *synthesizing* through social exchange’

Two Predominant Coupled Systems

- › We consider that there are two predominant, coupled systems at play within contemporary organizations, one to do with collaborative social influence (CSI) in which the social drives the IT (SIT) e.g., in a design department and the other to do with coordination, rule and control (CRC) in which the IT drives the social (ITS), e.g., Just in Time manufacturing:
 - ‘**CRC / ITS** systems seek to program (as opposed to programme) the relationship between technical processes and humans by digitizing performance fidelity and coding for repeatable *risk free* procedures in computer-control (cyber) spaces so that data and communication do not [temporally] contradict each other ’.
- › By contrast:
 - ‘**CSI / SIT** systems stress the reciprocal interrelationship between humans and computers to foster improved shared awareness for agilely shaping the social programmes of work, in such a way that humanity and ICT [control] programs do not contradict each other ’.

- › We consider that **Cyber** comprises two sub-systems: ‘Coordination Rule and Control (CRC)’ and ‘Collaboration and Social Influence (CSI)’.
- › These system attributes provide the necessary and “requisite variety” to enable both *control*, ‘in time’, and *influence*, ‘over time’. In this regard, Cyber may consist of two poles:
 - ‘A technologically bounded, largely immeasurable, strongly scientific, stochastic *coordination*, *rule* and *control* space; comprising virtual-media and the display of data dealing with the *real* communication of *facts*; and the *conceptualization* of alternative possibilities, themselves capable of generating hard physical and soft more *social* effects and *collaboratively influencing* them’

Leadership and Management



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Institutional Knowledge

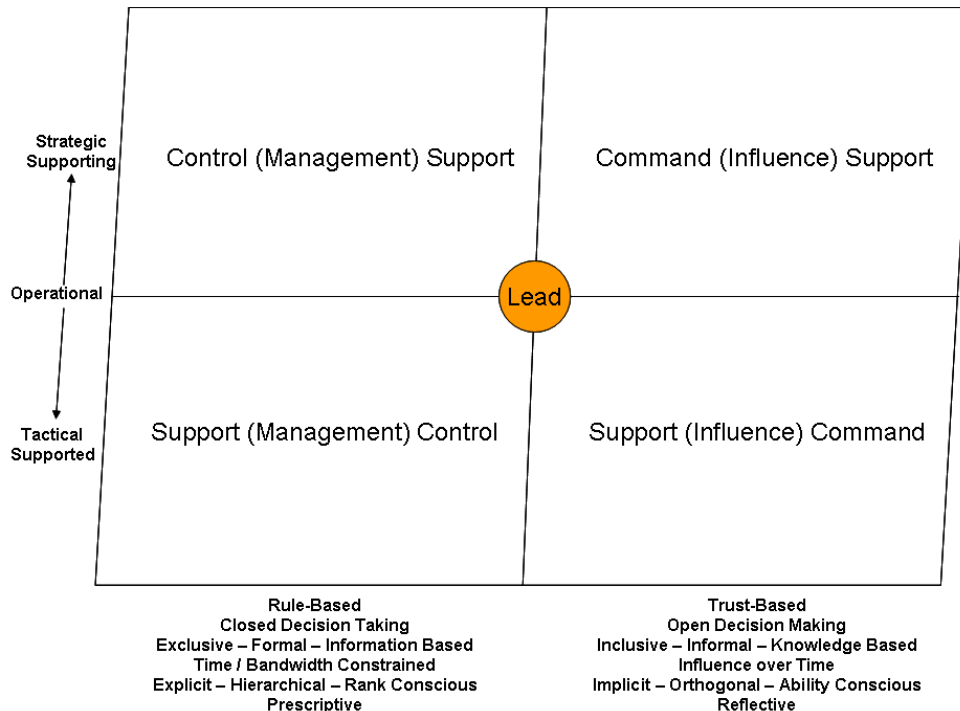
- › Combining the Milton model into a structural knowledge matrix, it is possible to 'situate' institutional knowledge.
 - An effective institution capable of learning – and continuing to learn – needs to occupy the strategic, unknown-unknowns (its research and thinking capacities) and co-adaptive, unknown-knowns (its design and adaptation capacities) competencies and to 'guard what it knows' (e.g., for a Navy to build, crew and fight warships).
 - That same institution needs to retain certain core knowledge (known-unknowns) but can choose to transfer elements of its non-core business (known-knowns) to an external agency (e.g., management of pay rolls).
 - Effective (as opposed to just efficient) institutions also retain 'in-being' the reflective capacity – capable of identifying and exploiting 'new and evolving knowledge'.

| | | |
|---------------------------|--|--|
| New Emergent Knowledge | Strategic Competence Unknown-Unknowns | Co-Adaptive Competence Unknown-Knowns |
| | Non-Core Competence Known-Knowns | Core Competence Known-Unknowns |
| Old established Knowledge | | |
| | | |
| | Low Level of In-House Knowledge | High Level of In-House Knowledge |

Organizational Knowledge Matrix after Milton and Rumsfeld



Leadership and Management



Non Orthogonal (connected) Command (Influence) and Control
Quadrants Merging work by Alberts & Hayes, [58] and Reay
Atkinson & Moffat [13]

› Drawing on work by Alberts & Hayes and Reay Atkinson & Moffat we differentiate between *fidelity*, in terms of 'removing noise from an info/techno-socio system' (see Atlan & Cohen, [59]) and *agility*, in terms of a socio-techno system's 'reflective capacity', to suggest:

- 'Management & Control may be a function of rules, time, bandwidth and fidelity, whereas Command & Leadership may be a function of influence, trust, collaboration and agility' [60].
- **Note:** that while the word 'command' is often associated with strict rules and control mechanisms, it is being used here in the military sense, where it is roughly synonymous with leadership.

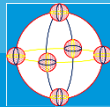
Organizational / Institutional Health

‘Specialist (Technical / Engineering) Leadership is likely to be trust and influence based, exercising a reflective, conceptual and implicitly ability conscious, open, inclusive and informal, decision making / taking style’

- › After He & Wong, successful organizations are constantly balancing between the *exploitative* (delivered *in time* by management & control) and the *explorative* (delivered *over time* through command & leadership).
- › The balancing between management & control (the exploitative) and command & leadership (the explorative) to keep an organization *in kilter* is known also as *ambidexterity*.
- › This suggests that the ability to *dynamically balance* between the *exploitative* and the *explorative* is indicative of a systems ability to *problem solve* and, hence, of its health.
- › Organizations and Institutions that cannot problem solve are *unhealthy places to be* and to which people do not want to belong...

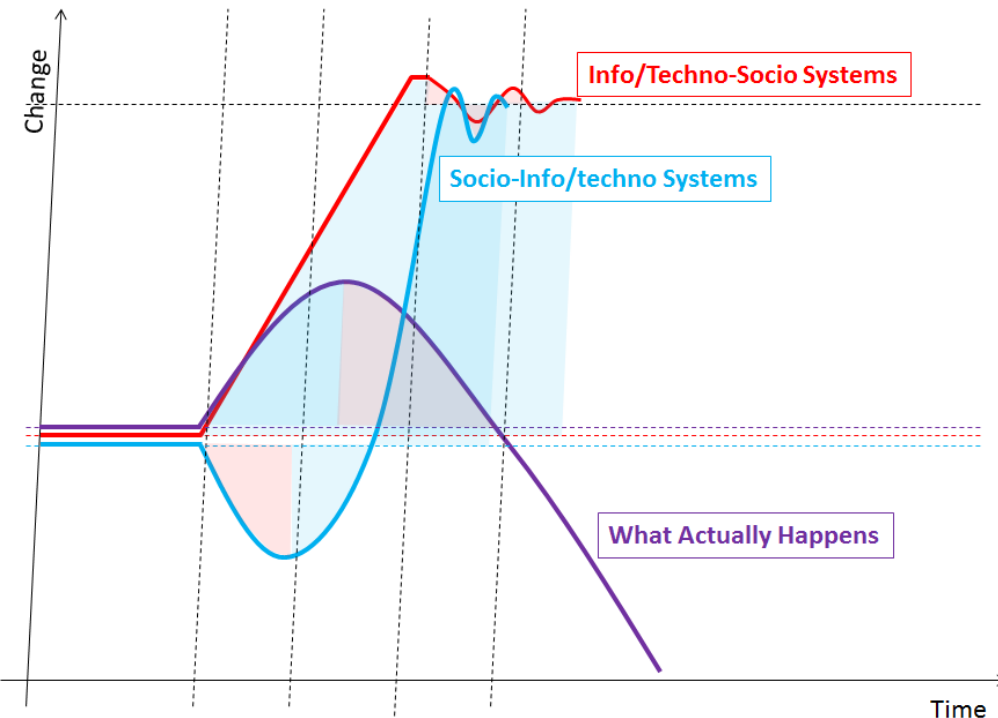
Where are the Liberal Democracies at this stage – where are You?

Coping or Failing





The 10 Year Rule

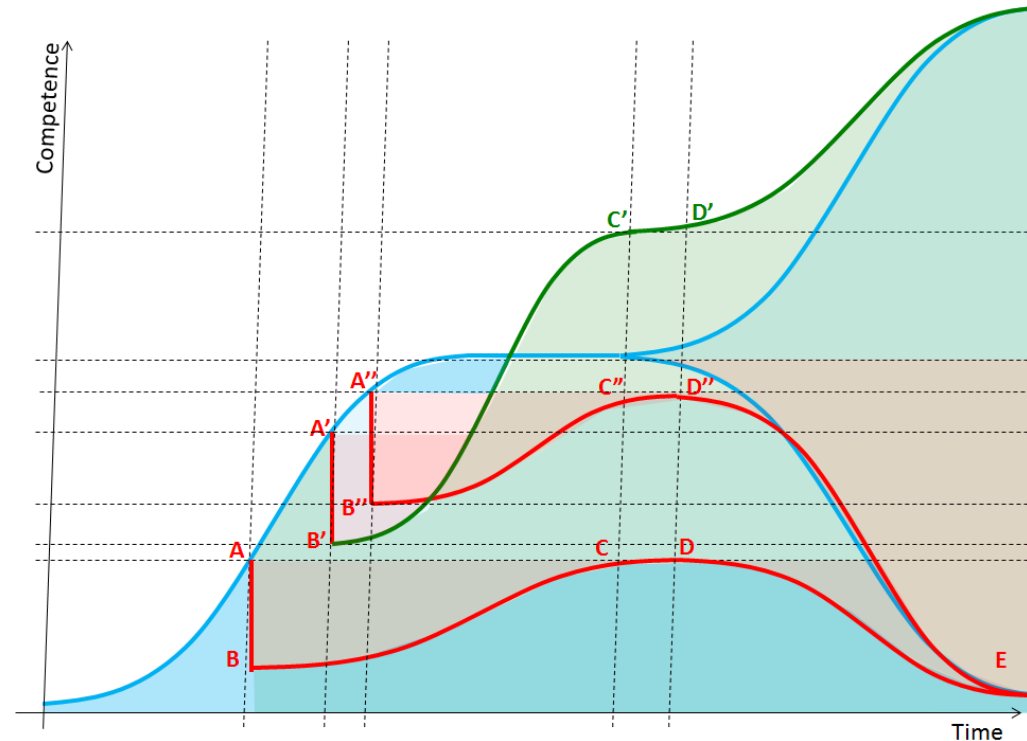


Change Dynamics ITS System versus SIT System and what actually happens when wrongly applied

- › A traditional view of Change Management is shown by the 'step change' applied to a ITS control type system.
- › Change creates an instantaneous (linear, over time) response from the system until it reaches the required change state. At this point there is some *hunting* as the system settles to its new state and awaits future demands.
- › What happens when this model is applied to a SIT system, is that the system responds as directed to meet set targets. Over time, because of lack of investment and the recognition that change is costly to any organization (there are often very good individual and collective reasons not to change) performance actually falls off.

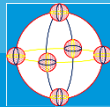
Resilient Organizations

- › 'If an individual suffered a 'shock' early in their tour (A) then there is an immediate loss of competency A-B but, more significantly, that individual would never recover to a level of competency higher (MI) than they were when the shock occurred by the end of their tour, B-C/D'.
- › 'If the individual suffered a shock A'' later in their tour the same shock occurred, A''-B'', and although the individual would not recover to a level above that when the shock occurred, the overall loss in competency and MI was much reduced (A''-C''/D'').
- › 'If the individual was part of a close knit collaborative (shared aware) networked team with high MI, then although the individual may suffer the same shock than when working alone / as an individual, A'-B', just as the shock was mitigated and shared, so the individual and team learned. Consequently, the final competency level (C'-D') was improved. The organization had become more **Resilient**



Managing Shock and Collaboration, Over Time

A Call to Arms



- › Foreman introduced the concept of *Quatrage*, recognizing that rather than triage, given the number of seriously injured service personnel (mostly young men) returning from Iraq and Afghanistan who would not have survived in previous conflicts – and that *Triage* had broken down.
 - These numbers in the United States, United Kingdom and Australia as well as other Allies such as Canada, Denmark and the Netherlands now run into their thousands. This does not represent the subsequent waves of sufferers from PTSD yet to come.
- › Many of our institutions have failed, see UK House of Common's Public Administration Select Committee report regarding the failure of the UK at the strategic level.
- › This strategic failure is not confined to the UK and but also extends to the political, sûreté and economic departments and institutions of state that serve them.

- › Our People want to belong and to contribute.
 - We have a significant number of injured service personnel returning from the wars.
 - We have a responsibility to them and also to our young people to enable them to thrive *successfully, happily* and *healthily* in the knowledge enterprise economies (KEEs) of the 21st Century.
- › This will be our greatest *sûreté* – providing *resilience* against future shocks and existential tyrannies.
 - Concepts such as the UK Veterans Information Communication Technology Occupational Recovery (VICTOR) enterprise that seeks to employ injured service personnel in operational centers to civil solve problems (handling the disruptions caused by ash clouds, for example), over time, may be just such an innovative example.

- › Designs for public service institutions such as the civil/ public service are in desperate need of overhaul, witness the Global Financial Crisis but also the *affordability* bubbles bursting in higher education and in health.
 - New designs are called for that will be affordable (politically, militarily and economically) and sustainable into the future.
 - For defense and *sûreté*, this means us all (politicians, business folk, financiers, bankers, industrialists, public and civil servants, soldiers, sailors, marines, airmen, academics, and researchers) thinking again with more of a strategic and adaptive than a static peacetime mentality.
- › The dis-association and disaggregation of people from IT and the desire for more and more Cyber-IT to control the social (ITS) will need reconsidering. In simple terms, we have spent the last thirty years taking people out of the system – and so increasing the likelihood of shocks by reducing *resilience* – and need now to start putting our people (from all walks of lives and backgrounds) back in the driving seat (SIT).
- › Key to the Knowledge Enterprise Economies (KEEs) of the 21st Century, will be how we lead and manage our people in the future – and, as we have argued at both the Universities of Sydney and Cambridge and amongst ourselves, how we ‘design humanity back into the loop’ and so rebuild our *enlightening* ‘cities upon the hill’.

Let us not despair but rather design our cities afresh, constructed upon great hills, and inhabited by peoples humbly aware of their humanity and responsibilities; trusted to build our institutions and organizations afresh upon rocks stronger than oceans, wind-swept, God-blessed, and teeming with people of all kinds living in harmony and peace, cities with free ports humming healthily and happily with commerce and creativity.

Questions

